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ABSTRACT

A study involving more than 300 students (in 15 courses at three two-year colleges) and their instructors was conducted during winter 1979 to determine if the interaction of preferred learning styles with preferred teaching styles can affect: (1) student achievement as measured by end-of-course grades and/or (2) student rating of instruction as measured by traditional rating instruments. Local researchers used a standardized packet of materials that included learning and instructional style inventories, student rating of instructor forms, and grade recording sheets. Collected data were used to determine scores representing the average of the absolute difference between student and instructor profiles based on 20 learning/teaching preferences. Study results, determined from a correlation coefficient matrix, revealed no statistically significant relationship between student-teacher differences and grade and/or rating of instruction. The data did, however, reveal that student preferences for organization and detail were positively related to grade and that independence was negatively related to grade. Preferences for inanimate content, listening, iconics, and direct experience were also related to grade. A profile of students by grade received indicated that "A students" tended to reject reading and accept listening and direct experience as preferred modes of learning. (JP)

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RELATIONSHIPS BETWEEN LEARNING STYLES, GRADES, AND STUDENT RATINGS OF INSTRUCTION

Council North Central Community Junior Colleges

Research Report

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Introduction

College teaching and learning, as an activity, is undoubtedly one of the most complex interactions in which humans are purposefully engaged. Attempts to describe these interactions always fall short and seem too simplistic.

Few researchers have attempted to describe teaching-learning interactions. Ryans (1960) completed an extensive teacher characteristics study using a student rating approach. This research provided information on descriptive variables such as teacher warmth, orderliness, and enthusiasm. Flanders (1969) has published research related to classroom interaction. Flanders' approach was based on observers' recordings of teacher and student activity every few seconds over ten interaction categories. These recordings were then converted to tallies on a 10 x 10 matrix so that the two axes indicated the kind and sequence of behaviors exhibited by both the teacher and the students over a period of time. Flanders' research and his method of interaction analyses provided useful information for the practitioner and researcher alike.

Reimanis (1972) completed interesting research using communtiy college students and two-year college instructors. The researcher examined interactions between identified student descriptors, instructor descriptors and instructional methods. Learning

effectiveness was also related to faculty attitude toward student learning and to structured instructional methodologies.

Mann (1970) in a comprehensive longitudinal study of classroom interaction followed four college classes over a period of one semester. Using trained observers Mann and his colleagues were able to identify seven student clusters and six teacher roles. Interaction analyses allowed Mann and his colleagues to generalize both teacher and student behavior and to predict reactions based on specified proactions. This research also provides important insight into the complex teaching-learning interaction.

Hunter (1978) has said that measurable non-cognitive factors, such as learning style, achievement anxiety and locus of control provide important information for college educators involved in building curriculum and delivering instruction. Hunter further cites studies by Canfield on learning styles which identified sixteen style dimensions plus an important expectation variable. The Canfield Learning Style Inventory (LSI) and the Instructional Style Inventory (ISI) may be examined for dimensions which are compatible as well as dimensions which may not be compatible.

Brainard and Ommen (1977) examined LSI profile differences for males and females enrolled in a suburban community junior college. Based on a sample of more than 3000 students these researchers reported differences (p less than .01) on 10 of the 16 profile dimensions and on the expectation variable. Differences indicated that females preferred that learning be structured through attention to organization and detail, that the qualitative and people aspects of learning be featured and that listening is a preferred mode of learning. Males indicated that they are more comfortable in

competitive situations, and are more likely to be independent, usually prefer numerics and prefer working with inanimate things. Females hold higher expectations for achievement in college courses.

Hunter and McCants (1977) in research based on analysis of the Learning Style Inventory data collected from 1000 randomly selected students at Sinclair Community College in Dayton, Ohio, recognized important learning style differences between community college students on 12 of 16 profile dimensions with respect to age groups.

Unpublished correlational studies at Longview Community College and the University of Missouri-Columbia indicate that at least five learning style dimensions are related to college course achievement. These studies suggest that teacher affiliation, organization, independence, competition, and expectation scores are related to student achievement across courses, levels, and teachers. The same studies suggest that mode and content dimensions are probably powerful predictors of success (or failure) for students enrolled in specific courses and with specific teachers. (Hunter 1978)

The writer believes that interaction of preferred learning styles with preferred teaching styles may affect student achievement as measured by end-of-course grade and may affect student rating of instruction as measured by traditional rating instruments.

Research Design

For the purpose of this study the research design was developed to seek answers to the following questions:

1. Is a significant portion of the variance within student ratings of instruction dependent on any measured learning style variable?

2. Is a significant portion of the variance within student ratings of instruction dependent on any measured difference between learning style and instructional style categories?

3. Is a significant portion of the variance within student end-of-course grades dependent on any measured learning style variable?

4. Is a significant portion of the variance within student end-of-course grades dependent on any measured difference between learning style and instructional style categories?

5. Is a significant portion of the variance within student end-of-course grades dependent on student ratings of instruction?

In order to draw a representative student sample the researcher drew five colleges from the listing of 419 two-year colleges located in the nineteen state North Central Accreditation Region. Chief administrators at three of these colleges agreed to participate in the study. A local research person was designated at each college. The local researcher identified five or more cooperating teachers as representatives of the total faculty. Thus more than 300 students in three colleges and fifteen courses, were identified as samples.

1. Local researchers received packets containing instructions, LSI and ISI materials, student rating materials, answer sheets and data recording sheets. Specifically the packet contained:

1. Thirty Learning Style Inventories & Answer Sheets.
2. One Instructional Style Inventory & Answer Sheet.
3. One hundred and fifty Student Rating of Instruction Forms.

4. Data Recording Sheets and Instructions.

The researcher visited each college during the 1979 Winter Term in order to observe the research climate and to become acquainted with the local researcher and the participating teachers.

The LSI and the ISI instruments were administered at the beginning of the 1979 Winter Term. The data was coded by teacher and student to assure alignment of information and to protect the identity of each participants.

The following information was transmitted back to the researcher by each local researcher.

1. Individual teacher Instructional Style profiles, coded by teacher number.
2. Individual student Learning Style profiles, coded by teacher and student number.
3. Individual Student Rating of Instruction profiles coded by teacher and student number.

The researcher used the data in 1 and 2 above to determine the accumulated difference scores for each student in the sample. These scores were determined by summing the absolute differences between a given teacher profile and each corresponding student's profile for each category...conditions of learning (eight scores), content of learning (four scores) and mode of learning (four scores).

The Student Rating of Instruction instrument was administered at the end of the Winter Term.

Student grade, coded by teacher and student numbers, were mailed with the student rating data.

In total the researcher had the following information available.

A. Preferred Learning Style Profiles (and Teaching Style) which consists of twenty useful variables under four categories:

Conditions of Learning

Variable 1. Peer Affiliation

" 2. Organization

" 3. Goal Setting

" 4. Competition

" 5. Teacher Affiliation

" 6. Detail

" 7. Independence

" 8. Authority of Others

" 9. Condition Differences Between Teacher & Students

Content of Learning

Variable 10. Numerics

" 11. Qualitative

" 12. Inanimate

" 13. People

" 14. Content Differences Between Teacher & Students

Mode of Learning

Variable 15. Listening

" 16. Reading

" 17. Iconics

" 18. Direct Experience

" 19. Mode Differences Between Teacher & Students

Expectation of Achievement

Variables 20. Computed Expectation

B. Student Rating of Instruction

Variable 21. Rating

C. Student Grade in Course

Variable 22. Grade

Treatment of Information

Several levels of analyses were used in treating the information obtained from the participating colleges.

1. Information was grouped by four grade levels (A, B, C, & D). See Table I.

2. A 22 x 22 coefficient of correlation matrix was developed in order to identify any relationships between paired variables. See Table II through V.

3. One-way Analysis of Variance was completed using each of the twenty-one variables as variable x and grade as variable y. See Table VI.

4. The Scheffe Test of difference between means was used to identify differences between pairs by grade level means, when the ANOVA yielded a significant F value.

Based on Table II, six of the nine variables included under Preferred Conditions of Learning were related* to at least one other variable outside of that category. Organization was positively related to Listening, Direct Experience, Expectation and Grade, and negatively related to Iconics. Instructor Affiliation was positively related to Iconics and Rating, and negatively related to Content Differences, Reading and Expectation. Detail was positively related to Listening and negatively related to Iconics and Rating. Independence was negatively related to Listening. Authority was positively related to Content Differences. Condition Differences was negatively

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*Related, ie. $r \neq 0$, $p < .05$

TABLE I

DESCRIPTIVE STATISTICS BY LEVEL OF GRADE

(N = 285)

Variables	A (N = 90)		B (N = 75)		C (N = 53)		D (N = 58)	
	X	SD	X	SD	X	SD	X	SD
1	12.97	3.0	13.43	2.9	12.13	2.7	12.41	2.9
2	9.42	2.5	10.01	2.5	10.62	2.6	10.33	2.3
3	12.30	2.6	11.43	3.0	11.90	2.8	11.84	2.7
4	15.31	2.3	14.86	2.8	15.26	2.9	15.33	3.0
5	9.78	3.5	9.97	3.3	9.23	2.8	10.05	3.4
6	10.42	2.8	10.69	2.4	11.89	3.0	10.84	2.4
7	15.21	2.6	13.68	3.0	14.08	2.8	14.40	2.8
8	14.60	3.0	15.67	2.6	14.72	3.4	14.66	3.0
9	25.27	6.8	26.25	6.0	27.38	8.5	25.40	6.2
10	14.02	3.7	14.04	4.2	12.91	4.3	14.41	3.7
11	13.20	3.6	13.39	3.9	14.08	3.8	12.53	3.3
12	11.87	4.1	10.75	3.9	10.55	4.1	12.47	3.8
13	10.91	3.5	11.89	3.7	11.52	4.4	10.59	3.6
14	14.50	7.4	15.76	7.7	14.94	7.2	16.19	6.5
15	10.90	3.1	12.83	3.3	11.81	3.0	10.79	2.7
16	15.10	3.6	15.19	3.4	14.92	3.3	14.24	3.1
17	13.66	3.1	12.13	3.2	12.71	3.2	12.84	3.3
18	10.24	4.0	9.91	3.2	10.33	3.3	12.12	3.3
19	14.24	6.5	13.75	6.2	14.54	5.2	12.84	4.8
20	9.52	8.7	16.33	10.3	17.10	9.2	20.86	11.2
21	72.04	11.1	73.17	8.5	73.45	7.3	71.50	7.6

For variables 1 thrcugh 20;
Low Scores indicate preference, High Scores indicate rejection.

TABLE II

SIGNIFICANT CORRELATION COEFFICIENTS

BETWEEN PREFERRED CONDITIONS OF LEARNING AND OTHER MEASURED DIMENSIONS

(N = 285, $p < .05$)

Conditions of Learning and Variable	
1	Peer - No sign. Correlation Coefficients
2	Org. - List. + 0.13, Iconics - 0.19, Dir. Exp. + 0.13, Expect. + 0.19, Grade + 0.14
3	GS - No Sign. Correlation Coefficients
4	Compet. - No Sign. Correlation Coefficients
5	Instr. - Diff. -0.15, Reading -0.15, Iconics + 0.23, Expect. -0.13, Rating + 0.13
6	Detail - List. +0.13, Iconics +0.15, Rating - 0.17
7	Indep. - List. +0.18
8	Auth. - Content -0.13
9	Diff. - Content -0.17

related to Content Differences. Most of the relationships identified so far seem logical. However, it may be important to note that only Organization was related to grade. Other condition variables were not significantly related to grade (Peer Affiliation may be negatively related to grade ($r = -0.10$, $p < 0.09$). As might be expected Instructor Affiliation was positively related to Rating, however, Detail was negatively related to Rating. The difference scores, representing the average of the absolute difference between student profile and teacher profile, were determined in an effort to assess differences between a teacher's preferred instructional style and students' preferred learning style. The writer hypothesized that these differences might be related to grade and/or student rating of instruction. Thus, it is a disappointment to report that the correlation coefficient matrix did not detect any relationship existing between student-teacher differences in preferred learning or teaching styles and grade or rating of instruction. (Some interesting interactions between specific styles and grade were uncovered by the analysis of variance and the Scheffe test for differences between means. These will be discussed later.)

As illustrated by Table III, which considered correlations between preferred Content of Learning and other measured variables, only Qualitative and Inanimate preferences were related to other variables. Qualitative was positively related to Listening and Reading, and negatively related to Iconics and Direct Experiences. Conversely, Inanimate was negatively related to Listening and Reading and positively related to Iconics and Direct Experience.

Table IV illustrates the several relationships between Preferred

TABLE III

SIGNIFICANT CORRELATION COEFFICIENTS

BETWEEN PREFERRED CONTENT OF LEARNING AND OTHER MEASURED DIMENSIONS

(N = 285 $p < .05$)

Content of Learning and Variable		
10	Numerics	- No Significant Correlation Coefficients
11	Qualitative	- List.+0.18, Reading +0.25, Iconics -0.15, Dir. Exp. -0.26
12	Inanimate	- List.-0.37, Reading -0.22, Iconics +0.15, Dir. Exp. + 0.40
13	People	- No Significant Correlations Coefficients
14	Diff.	- No Significant Correlations Coefficients

TABLE IV

SIGNIFICANT CORRELATION COEFFICIENTS

BETWEEN PREFERRED MODE OF LEARNING AND OTHER MEASURED DIMENSIONS

(N = 285 p < .05)

Mode of Learning and Variable		
15	List.	- Expect +0.13
16	Reading	- No Significant Correlation Coefficients
17	Iconics	- Expect. -0.21
18	D.Exp.	- Grade +0.20
19	Diff.	- No Significant Correlation Coefficients

TABLE V

SIGNIFICANT CORRELATION COEFFICIENTS

BETWEEN COMPUTED EXPECTATION, GRADE AND RATING

(N = 285, $p < .05$)

Variable		
20	Expectation	- Grade + 0.37
21	Rating	- No Significant Correlation Coefficients

The remaining relationships were illustrated by Table V. This table confirms the strong relationship between Computed Expectation and End-of-Term Grade. Other correlation coefficients were not significant.

Mode of Learning and some of the remaining variables. Listening was positively related to Expectation. Iconics was negatively related to Expectation, and Direct Experience was positively related to Grade.

Eight of the twenty-one one-way ANOVAs produced significant F values. These analyses sought to identify sources of variance in grade awarded based on preferred learning styles, differences between learning and teaching styles, grade expectation or student rating of instruction. Although these variables do not account for a major portion of the variance (see R Squared values, Table VI), several should be considered as important predictors of grade.

Preferences for Organization, Detail and Independence are related to grade. Interesting, Organization and Detail were positively related to grade and Independence was negatively related to grade. Preferences for Inanimate Content was also related to grade, as was Listening, Iconics and Direct Experience. Computed Expectation accounted for about 16% of the grade variance with an F value of 17.52 ($P < .0001$). Student Rating of Instruction and Difference scores were not related to grades.

The Scheffe Analysis when used with significant ANOVAs, help identify the underlying details of these relationships. Tables VII through XIV were produced to further illustrate these details.

An examination of Tables VII and VIII confirm the relationship between Organization and Grade and Detail and Grade. In both cases, A students preferred structure (Organization & Detail) to a greater extent than C students ($p < .05$). Table IX confirms that C students prefer Independence to a greater extent than B students ($p < .05$). And Table X indicates that B students prefer Inanimate Content

TABLE VI
SUMMARY OF ONE-WAY ANOVA FOR EACH OF TWENTY-ONE VARIABLES & GRADE LEVEL
(N = 285, p .05)

Variable x	Variable y	DF	F	PR > F	R Square
1 Peer Affiliation	Grade*	3*	2.57	NS	0.027
2 Structured Organization	Grade	3	2.98	<.05	0.031
3 Goal Setting	Grade	3	1.32	NS	0.014
4 Competition	Grade	3	0.47	NS	0.005
5 Instruction Affil.	Grade	3	0.72	NS	0.007
6 Structured Detail	Grade	3	3.56	<.05	0.037
7 Independence	Grade	3	4.50	<.05	0.047
8 Authority	Grade	3	2.15	NS	0.023
9 Difference	Grade	3	1.16	NS	0.012
10 Numeric	Grade	3	1.50	NS	0.016
11 Qualitative	Grade	3	1.67	NS	0.018
12 Inanimate	Grade	3	3.29	<.05	0.034
13 People	Grade	3	1.67	NS	0.018
14 Difference	Grade	3	0.80	NS	0.008
15 Listening	Grade	3	6.88	<.05	0.071
16 Reading	Grade	3	1.02	NS	0.011
17 Iconics	Grade	3	3.21	<.05	0.034
18 Dir. Experience	Grade	3	4.94	<.05	0.051
19 Difference	Grade	3	0.95	NS	0.010
20 Expectation	Grade	3	17.52	<.05	0.162
21 Rating	Grade	3	0.44	NS	0.005

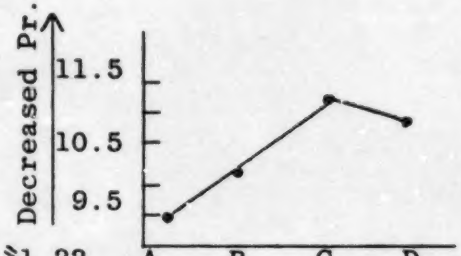
(* Four Grade Levels, 4-1 = 3 dF)

SCHEFFE ANALYSIS* OF
DIFFERENCES BETWEEN MEANS BY GRADE LEVEL

TABLE VII

Structure Organization

Grade Level	$\bar{X}$	
A	9.42	*
B	10.01	
C	10.62	
D	10.32	

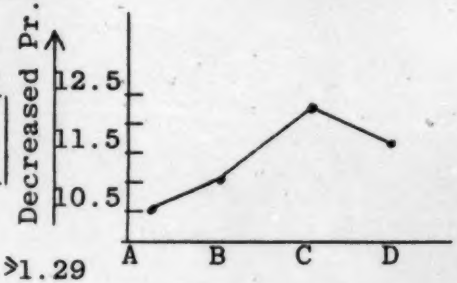


Critical Difference ≯1.22
*Sign

TABLE VIII

Structure Detail

Grade Level	$\bar{X}$	
A	10.42	*
B	10.68	
C	11.88	
D	10.84	

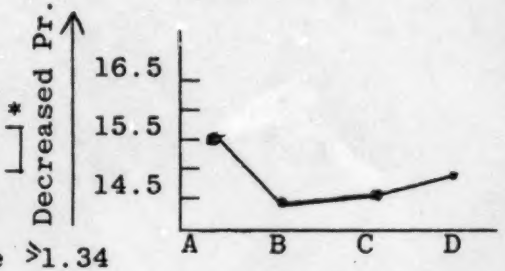


Critical Difference ≯1.29
*Sign

TABLE IX

Independence

Grade Level	$\bar{X}$	
A	15.20	
B	15.66	*
C	14.04	
D	14.39	

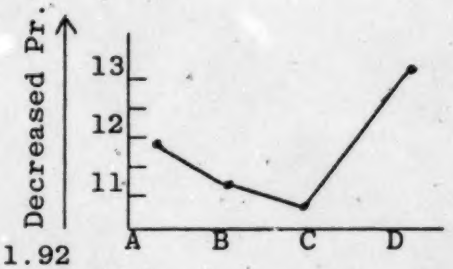


Critical Difference ≯1.34
*Sign

TABLE X

Inanimate

Grade Level	$\bar{X}$	
A	11.86	
B	10.74	*
C	10.54	
D	12.46	



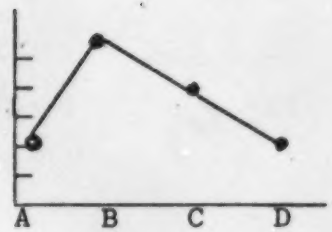
Critical Difference ≯ 1.92
*Sign

TABLE XI

Listening

Grade Level	$\bar{X}$	
A	10.90	*
B	12.82	
C	11.80	*
D	10.79	

Decrease



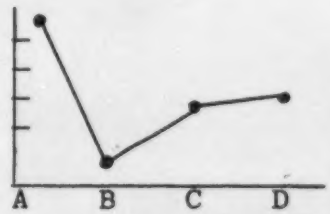
Critical Difference 1.50
*Sign

TABLE XII

Iconics

Grade Level	$\bar{X}$	
A	13.65	*
B	12.13	
C	12.71	
D	12.84	

Decrease



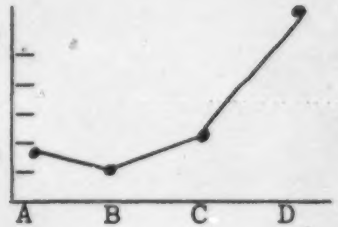
Critical Difference 1.55
*Sign

TABLE XIII

Direct Experience

Grade Level	$\bar{X}$	
A	10.24	
B	9.90	*
C	10.36	*
D	12.12	

Decrease



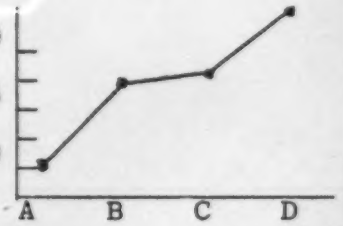
Critical Difference 1.72
*Sign

TABLE XIV

Expectations

Grade Level	$\bar{X}$	
A	9.52	
B	16.33	*
C	17.09	*
D	20.81	*

Decrease



Critical Difference 4.78
*Sign

(*Based on Sign. ANOVA)

compared to D students.

A students differ from B students with respect to their preference for Listening ($p < .05$) and B students differ from A students with respect to Iconics ($p < .05$) as illustrated by Tables XI and XII. Table XIII shows the preference held by B students for Direct Experience in contrast to D students ($p < .05$). Computed Expectation, Table XIV, shows a near linear relationship between Expectation scores and Grade, ie, A students expect to do well, B & C students are more modest and D students hold relatively low expectation of a high grade.

These analyses provide the following conclusions regarding A, B, C, and D students:

1. A students show stronger preference for Organization, Detail & Listening. They show lower preference for Iconics and Inanimate content.
2. B students show stronger preference for Iconics, Inanimate and Direct Experience and lower preference for Independence and Listening.
3. C students show preference for Independence & Inanimate, while showing lower preference for Organization & Detail.
4. D students tend to reject Inanimate content, and Direct Experience, while preferring Listening and Independence.
5. Computed Expectation is the best single predictor of Grade.

Discussion

The researcher sought answers to a number of questions involving relationships between preferred learning styles, differences between learning and teaching styles and student rating of instruction and grade awarded by the teacher.

The student rating of instruction variable was not related to grade, preferred learning style or measured differences between teaching and learning styles. Indeed the variance in rating scores was minimal (SD = 9.26), the mean scores for the four groups was about 72.5 (of a possible 85). The range in group means was less than 2 points (71.50 through 73.45). Thus, the rating instrument used was not useful in these analyses. Perhaps this instrument was not a reliable evaluation tool.*

The computed differences between preferred teaching style and preferred learning style was thought to be a possible measure of dissonance between teacher and student or between classroom procedures. This was not the case. Computed differences were not a significant source of variance in either the grade distributions or in the student rating of instruction.

Of considerable interest to the researcher was the finding that A students tend to reject reading and accept listening and direct experience as preferred modes of learning. A students also seem to reject independence and accept organization and detail as preferred conditions of learning. Since these preferences are related to A grades suggests that traditional college learning activities such as reading and independence may be on the decline because such behavior is not rewarded by grade. So called average students (C students), compared to A students tend to prefer affiliation with both peers and instructors and independence and reject organization and detail as conditions of learning. These students also seem to more readily accept numerics and reject qualitative as learning content.

*A very common complaint of researchers dealing with evaluation of instruction as a process.

This research affirms that while learning styles assessments provide an excellent diagnostic tool for counseling and individualizing instruction, the identification of the achiever has not been significantly clarified.

Perhaps future research should examine the actual mode, content and conditions of instruction with respect to students' preferred mode, content and conditions of learning. If instructional mode, content and conditions result from consumer preference, one would predict that current instruction could be described by the following terms:

Structured, non-competitive, dependent, authoritative, non-quantitative, people oriented, listening, little reading, and direct experience.

Traditional college instruction has usually been described by the following terms:

Creative, competitive, independent, quantitative and reading.

These speculations lead the writer to consider whether the decline of reading, independence, competition, quantification and creative thought are the inevitable result of consumer preference or whether preferred styles result from teachers rewarding dependence, listening, structure, authority, etc. with the A grade.

It must be left to the reader to speculate regarding the interaction between consumer preference and teacher behavior. Perhaps its a chicken and egg problem!

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